

CLAIMS

- 1 1. A spectrum enhancement system comprising:
2 a plurality of distributed filters, at least one of said filters for receiving a multi-
3 frequency input signal;
4 a plurality of energy detection units, each of which is coupled to an output of at
5 least one filter and each of which provides an energy detection output signal;
6 a weighted averaging unit that is coupled to each of said energy detection units
7 and that provides a weighted averaging signal to each of said filters responsive to the
8 energy detection output signals from each of said energy detection units.
- 1 2. The system as claimed in claim 1, wherein said weighted averaging signal is a
2 non-linear signal.
- 1 3. The system as claimed in claim 1, wherein said plurality of energy detection units
2 are coupled to the outputs of the filters via a plurality of differentiator units, each of
3 which is coupled to an output of each of said filters and to one of said energy detection
4 units.
- 1 4. The system as claimed in claim 1, wherein said differentiator units provide double
2 differentiation.
- 1 5. The system as claimed in claim 1, wherein said energy detection units provide
2 envelope detection.
- 1 6. The system as claimed in claim 1, wherein the multi-frequency signal is an
2 auditory signal.

- 1 7. The system as claimed in claim 6, wherein said system is used with a cochlear
2 implant.
- 1 8. The system as claimed in claim 1, wherein the multi-frequency signal is an
2 electromagnetic signal.
- 1 9. The system as claimed in claim 1, wherein said weighted averaging signal is
2 obtained by linear spatial filtering followed by a nonlinear unit.
- 1 10. A spectrum enhancement system comprising:
2 at least two filters h_j and h_{j+1} for receiving a multi-frequency input signal;
3 at least two energy detection units, each of which is coupled to an output of a
4 filter and each of which provides an energy detection output signal e_j and e_{j+1}
5 respectively; and
6 a weighted-averaging unit that is coupled to each of said energy detection units
7 and that provides a weighted-averaging signal I_j to a non-linear unit responsive to each of
8 said energy detection output signals e_j and e_{j+1} ;
9 said non-linear unit providing a resonant gain signal Q_j to said filter h_j responsive
10 to said weighted-averaging signal I_j .
- 1 11. The system as claimed in claim 10, wherein said energy detection units are
2 coupled to the outputs of the filters via a plurality of differentiator units, each of which is
3 coupled to an output of each of said filters and to one of said energy detection units.
- 1 12. The system as claimed in claim 10, wherein said differentiator units provide
2 double differentiation.

- 1 13. The system as claimed in claim 10, wherein said energy detection units provide
2 envelope detection.
- 1 14. The system as claimed in claim 10, wherein the multi-frequency signal is an
2 auditory signal.
- 1 15. The system as claimed in claim 14, wherein said system is used with a cochlear
2 implant.
- 1 16. The system as claimed in claim 10, wherein the multi-frequency signal is an
2 electromagnetic signal.
- 1 17. The system as claimed in claim 10, wherein said weighted-averaging signal is
2 obtained by linear spatial weighting.
- 1 18. A spectrum enhancement system comprising:
2 a plurality of serially distributed low pass filters, the first of which receives a
3 multi-frequency input signal;
4 a plurality differentiator units, each of which is coupled to an output of a low pass
5 filter and each of which provides a differentiator output signal;
6 a plurality of energy detection units, each of which is coupled to an output of a
7 differentiator unit and each of which provides an energy detection output signal;
8 a weighted averaging unit that is coupled to each of said energy detection units
9 and that provides a weighted averaging signal to each of said low pass filters responsive
10 to the energy detection output signals from each of said energy detection units.

- 1 19. A system as claimed in claim 18, wherein said differentiator units provide a
2 double differentiator function.
- 1 20. A system as claimed in claim 18, wherein said differentiator units provide a unity
2 differentiator function.
- 1 21. A method of providing spectral enhancement, said method including the steps of:
2 receiving a multi-frequency signal at a first low pass filter h_j and receiving an
3 output of said first low pass filter at a second low pass filter h_{j+1} ;
4 providing a first energy detection signal e_j responsive to the output of said first
5 low pass filter;
6 providing a second energy detection signal e_j responsive to the output of said
7 second low pass filter;
8 providing a weighted averaging signal I_j to a non-linear gain unit responsive to
9 each of said energy detection output signals e_j and e_{j+1} ; and
10 providing a resonant gain signal Q_j to said low pass filter h_j responsive to said
11 weighted averaging signal I_j .
- 1 22. The method as claimed in claim 21, wherein said method further includes the step
2 of differentiating the output signals from each of said low pass filters h_j and h_{j+1} .